Teacher as Helper: Design a Constructivist Lesson(s) that emulates the PBL approach where the Teacher functions as a helper and guide throughout the process.

NOTE: Teacher candidates are required to post this lesson and all relevant files, instructions to the Wiki Page entitled [PBLCOUOIT@WIKISPACES.COM](mailto:PBLCOUOIT@WIKISPACES.COM)

As far as your required submission through WebCT’s assignment tab you are simply, in the text box provided by the assignment, to post this comment “All materials uploaded to Wikispaces page.”

**Constructivist Lesson Plan**

**Course: Physics 11, SPH3U**

**Unit 1: Kinematics and Dynamics**

**Topic: Motion and Forces**

1. ***Purpose***

To test student understanding of gravitational force related to the motion of a ball thrown in the air. Students will be expected to demonstrate an understanding of the central role of evidence in the accumulation of knowledge, and the ways proposed theories may be supported, modified and refuted. Students will be able to apply the concept of field to quantitatively explain, in terms of its source, direction and intensity, the gravitational effects of objects and systems.

1. **Introduction**

* Start by juggling one, two and then three balls in the air. Alternately, have volunteer students do some juggling.
* Indicate that today’s lesson is to try to come to an understanding of the motion of and the force acting on a ball thrown in the air.

1. **Creating-Understanding/Concept-Development**

* Use a parabolic trajectory for a ball being thrown in the air
* Draw arrows showing the motion of the ball—going up on the left.
* Indicate three positions on the trajectory—A, B & C.
* Ask: “What do you think the direction of the force acting on the ballis at A, B and C?”
* Ask students to use a sheet to help communicate their hypothesis.
* Have them indicate the direction of the ball on the way up and down.
* Now, have students draw force vectors (arrows) indicating the direction of the force acting on the ball at positions A, B & C.
* It is important that students do this work on their own without consulting peers.

1. **Coaching/Guidance**

* Discuss the validity of the arguments used in this thought experiment. Discuss the criteria used to judge assertions
* Discuss the evaluation of personal (or group) hypotheses.

Refer to Newton’s second law (*F = ma*)—where the acceleration and unbalanced force are in the same direction. Refer to the constancy of the force of gravity.

* If available, run a mini video clip for the modeling of the force acting on a cannon ball projected vertically into the air.
* Provide students with their homework exercise.
* Walk around and use individual interventions to provide coaching/guidance.
* As appropriate, use a group intervention to re-teach or reinforce concepts or instructions that have surfaced from individual questions or interventions.

1. **Summary**

* Review the idea of a thought experiment.
* Review the forces acting on a ball that is thrown near-vertically into the air.

1. **Homework**

* If appropriate, ask students to ask their parents/relatives at home the same question that was asked in class today.
* Complete the homework exercise for next day.

1. **Assessment**

* Periodically review the forces involved in trajectory motion and the usefulness of thought experiments.
* Include this trajectory law and the logical testing of hypotheses on future tests.

1. **Conclusion**

Since this is a constructivist lesson, it purposely does not review and link the new concept to old concepts. Personal hypotheses are created and tested in this lesson—tested logically, in a thought experiment. Personal hypotheses are used rather than the accepted scientific hypothesis, so that students’ prior knowledge can be brought forward and tested.

This lesson employs a thought experiment rather than a hands-on experiment. The reason for this is that the force acting on an object that is thrown into the air is not directly measurable. Students are asked to make predictions but the predictions are tested by logical and consistent thought rather than by experiment. The create-test-use cycle applies equally well to logical thought as it does to laboratory work. The hidden curriculum goals for learning about logical thought are made explicit.